

# Photometric study of the short-period RS CVn eclipsing binary DV Psc

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**Abstract.** We present our new photometry of DV Psc obtained in 2010 and 2011, and new spectroscopic observation on Feb. 14, 2012. During our observations, three flare-like events might be detected firstly in one period on DV Psc. The flare rate of DV Psc is about 0.017 flares per hour. Using Wilson-Devinney program, we derived the preliminary starspot parameters. Moreover, the magnetic cycle is  $9.26(\pm 0.78)$  year analyzed by variabilities of Max.I - Max.II.

**Keywords.** stars: late-type, binaries: eclipsing, stars: spots, stars: flare, stars: chromospheres

## 1. Introduction

DV Psc is a RS CVn-type eclipsing binary with high-level surface activity, which is characterized by the light-curve asymmetries (Robb et al., 1999; Vanko et al., 2007; Zhang & Zhang, 2007; Zhang et al., 2010; Parimucha et al., 2010) and Ca II H & K emission (Beer 1994). Therefore, it is a very intriguing object for studying stellar magnetic activity.

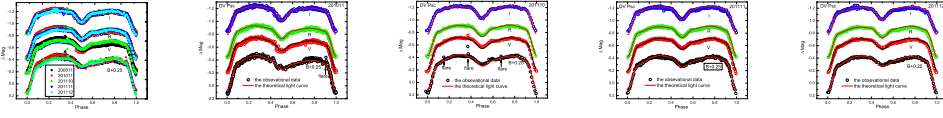
## 2. Light-curve and spectral analysis

Our new CCD photometric observations of DV Psc (Fig. 1) were made in four observing runs: 2010 Nov. 19, 20, and 2011 Oct. 27, Nov. 12 and 13, Dec. 08 and 10 with 85cm telescope (Zhou et al., 2009) at Xinglong station of the National Astronomical Observatories of China (NAOC). The spectroscopic observations of DV Psc were obtained with the 2.16m telescope at Xinglong station on 2012 Feb. 14 (Fig. 2). The OMR spectrograph centered at about 4280 Å with a reciprocal dispersion of 1.03 Å (Fang et al., 2010).

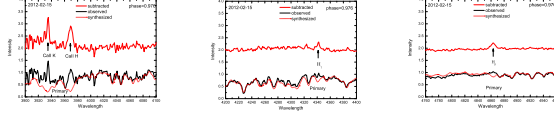
Multi-color light-curve analyses were carried out using the Wilson-Devinney program (Wilson & Devinney 1971; etc). The spot models are used to explain light-curve asymmetry based on the prior photometric solution (Zhang et al. 2010). The theoretical and observed light-curve are both displayed in Figure 1. The normalized spectra of DV Psc were analyzed in the Ca II H & K, H $\gamma$  and H $\beta$  lines with the spectral subtraction technique, which was described in detail by Barden (1985) and Montes et al. (1995).

## 3. Conclusion

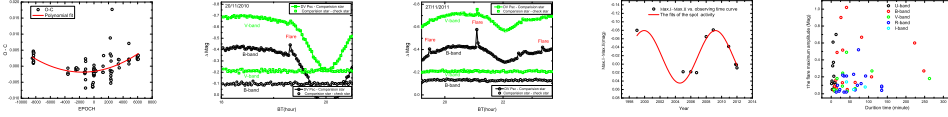
The results can be summarized as follows: 1. An updated linear ephemeris formula  $\text{Min.I} = \text{JD}(\text{Hel.})2454026.1424(2) + 0.30853609(8)\text{E}$  was obtained. Fitting all available light minimum times with a polynomial function showed that the orbital period of DV Psc increased (Fig. 3). 2. Our photometric and spectral results demonstrate that DV Psc



**Figure 1.** The light-curves with their best fits for DV Psc in *BVRI* bands.



**Figure 2.** The observed, synthesized, and subtracted spectra for the Ca II H&K,  $H_\beta$  and  $H_\gamma$  lines. The dotted lines represent the synthesized spectra and the upper are the subtracted ones.



**Figure 3.** (O - C) diagram, the flares in *B* and *V* band, and magnetic cycle for DV Psc. The relation of the flare amplitude and duration of late-type stars.

is very active. New four flare events of DV Psc were found and the flare rate is about 0.017 flares per hour (Fig. 3). The three flare-like events might be detected firstly in one period. The relation of the flare maximum amplitude and the flare duration of late-type stars (Kozhevnikova et al., 2006; Vida et al., 2009; Qian et al., 2012; Zhang et al. 2012, etc) are displayed in Figure 3. 4. The magnetic active cycle may be  $9.26(\pm 0.78)$  year, which was analyzed by the variabilities of Max.I - Max.II (Fig. 3). We will monitor later.

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